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JOURNAL OF EDUCATIONAL RESEARCH

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JOURNAL *of* EDUCATIONAL RESEARCH

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THE EFFECTS OF DELAYING BEGINNING READING A HALF YEAR IN THE CASE OF UNDERPRIVILEGED PUPILS WITH I. Q.s 75-95

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THIS paper gives the results of an experiment conducted in Public School 500, Manhattan, an experimental school established to study Binet children (I.Q.s 75-95) and Terman children (I.Q.s 130 and above). The study was designed to provide a comparison of the results obtained from giving a group of Binet children a full term of experiences without formal instruction in reading and the other common subjects with those secured when a definite program in reading was introduced in the first term. The subjects were the pupils comprising the Binet classes entering Public School 500 in February, 1936, and August, 1936. They were paired as nearly as possible on the basis of various characteristics determined during the first two months after entering school. The final groups consisted of 20 pupils each. We shall call the group entering in August, 1936, the young, or 1A group, and the class entering in February, 1936, the older, or 2B group. In matching them the following characteristics were considered.

Intelligence.—They were paired exactly in mental age, *at the time of entering school.* Considered at this time, the range was from 56 to 90 months; the mean was 5 years, 7½ months, at the time of entering school. At the time the experiment was begun, one group was entering and the other had been in school one semester and was six months older. At this time the mean mental age of the latter was 6 years, 1½ months. The intelligence quotients were equivalent, the means for both groups being approximately 87.

Reading Readiness Tests.—The Van Wagenen test was given on March 15, 1936 to the 2B group and on November 1, 1936 to the 1A.

The two groups were fairly well matched. The mean score for the 2B was 28 and the 1A, 26.3. The differences are unreliable. The means are low. The children obtained about the same score, in other words, when they first entered school.

In early October, 1936, the Metropolitan First Grade Readiness Test was given to both groups; about the middle of the month the Monroe Reading Aptitude and early in November the Van Wagenen. The mean scores at this time for the two groups were:

	1A	2B	Diff.	S.D.Diff.
Metropolitan	31	56.4	25.4	0.5
Monroe	32	40.6	8.6	0.28
Van Wagenen	26	33.9	7.9	0.26

All tests of reading readiness show that 2B had an advantage at the time the experiment was begun. The Metropolitan, which appraises readiness for various school activities, including reading, shows the greatest and most reliable difference.

Reading Ability at Beginning of Instruction.—The Gates Primary Test, Word Recognition, was given to both groups in October, 1936, after the pupils had been in school about a month and a half of the 1936-7 year and about two weeks before reading instruction had begun. The scores were: 1A, 1.23, 2B, 1.27. The first mean corresponds to a score of about one word correct; the second to about two. In other words, neither group had an appreciable degree of reading ability.

Sex.—Twelve of the twenty pupils in each group were boys.

Race and Nationality.—In both groups approximately half were children of foreign parentage. The cases used in the study were selected to give at least a roughly equal degree of foreign influence.

Socio-Economic Status.—Practically all the pupils came from poor homes. The parents of fifty-five percent of the 2B and sixty percent of the 1A pupils were on relief.

Physical and Mental Condition.—When the pupils entered school for the first time, a large percentage were ill-nourished, mentally poorly adjusted, discouraged, emotional or troublesome pupils. The roll of the 1A group runs, briefly, like this: (1) very nervous, fearful; (2) poor health, very shy; (3) poor home conditions, nervous, naughty; (4) malnutrition, sullen; (5) poor health, rheumatic fever; (6) poor health, nearly blind in one eye; (7) orphan, nervous, apprehensive; (8) obesity, sluggish; (9) retiring, shy; (10) artistic, loves attention; (11) poor home,

broken home; (12) very poor home conditions; (13) malnutrition, anti-social; (14) mischievous; (15) normal, poor home; (16) normal, clean, poor home; (17) shy, clean, poor home; (18) cardiac case; (19) shy, interested, alert; (20) normal but moody. The 2B class seems to rank a little lower. In the first group, five or six might be crudely classified as in pretty fair mental and physical condition, as compared to only about three in the 2B when they entered. On the other hand, the 2B had improved in both health and mental attitude as a result of the half year in school preceding the experiment.

Vision.—The Betts Telebinocular Tests of Vision were given by an experienced WPA examiner to both groups in October-November, 1936. All tested normal, except four in 2B and six in 1A. The four 2B deficiencies noted were: slight ametropia; three cases, one supplied with glasses, and some difficulty in fusion at reading distance. In 1B three revealed fusion difficulties, with or without ametropia; one astigmatism; one only fair acuity and one several difficulties including very low acuity in the right eye.[1] Since it is likely that the younger and less-experienced child does a little poorer in these examinations than the older and more "test-wise", it is estimated that *at the same stage* the two groups had about equal vision.

PROGRAM OF 2B GROUP DURING FIRST TERM

During their first term in school, the 2B class had no formal instruction in reading. Picture books, primer, preprimers and miscellaneous books were in the room; placards, notices, pictures, announcements, etc., were on display, but no special effort was made to teach the pupils to read them. The teacher drew attention to them, read them, answered questions about them, thus suggesting the function and nature of reading. The teacher carried out an informal program of the activity type. She attempted to interest the pupils in a variety of topics, chiefly those reflected in their everyday life, to foster conversation, and individual and group activities in connection with them. She told them things, took them on visits, helped them find pictures, make objects, do artistic and dramatic projects, ask questions, relate experiences, plan various enterprises, use common tools—shears, chalk, wood—listen to reports, interpret still and motion pictures, adjust to each other. In brief, she carried on an admirable activity program adjusted to the interests and needs of the pupils but devoid of formal instruction in the school subjects as such.

[1] This pupil's final reading status was near the mean of the group.

THE READING PROGRAM

During the year devoted to the present study, the first two months were spent in a non-reading or reading readiness program. The 2B class continued from where it left off; it thus had a term and two months of such experience. The 1A during the first two months was given a preparatory program with purposes similar to those outlined for the 2B. Thereupon, both groups took up the preliminary reading activities of a definite reading program. This began with work on a group of class charts accompanying the Gates-Huber reading program and combined their use with other activities suggested in the manual. After nearly three weeks with the charts, the primer and accompanying preparatory books were taken up. In addition to these, supplementary mimeographed materials composed of the same words employed in the texts were made available to the teachers.

During the following two months, the teachers interchanged classes frequently for reading instruction, and otherwise tried to keep the teacher and teaching factors similar. Differences in procedures, however, led to the abandonment of the interchanges and each teacher proceeded as seemed best to her. The time devoted to definite reading work remained fairly constant and, although differences in teaching were apparent, persons observing the teaching usually felt that, as far as the effects on learning to read were concerned, the differences were probably not important. The 1A teacher was regarded as more formal, more disposed to confine her work to the texts, more given to group instruction and systematic progress; the 2A teacher more disposed to work with individuals and small groups, to vary the program, and to enrich it, and less given to definite drill. On past records, both teachers were rated as highly successful in teaching reading.

RESULTS OF THE STUDY

Tests of reading ability were given at mid-year (February) and near the end of the year (June). In February were given the Gates Primary Reading Tests, Type 1, Form I, and Type 3, Form III, and two mimeographed tests based entirely on the vocabulary of the basal texts, one for word recognition and one for paragraph reading. These tests were given by experienced examiners employed in a Federal Works Progress project. The results are shown in Table I.

At mid-year, the 2B group showed some statistical advantage in every test, but in only one, recognition of words used in the basal materials,

TABLE I

SHOWING MEAN SCORES ON GATES READING TESTS AND TWO MIMEOGRAPHED TESTS AT MID-YEAR

	2B	1A	Diff.	S.D. Diff.
Word Recognition (words taught)	12.3	7.1	5.2	0.08
Paragraph Reading (words taught)	6.3	6.1	0.2	0.08
Gates Primary (word recognition)	1.48	1.32	0.16	0.10
Gates Primary (Par. reading)	1.65	1.54	0.11	0.12

is the superiority reliable. The achievements of the two groups may be shown in the form of the percentage of pupils in 2B equalling or exceeding the median score of the 1A. They are as follows:

In recognition of words studied	65%
In reading of paragraphs composed of words studied	60%
In Gates Primary, Word Recognition	70%
In Gates Primary, Paragraph Reading	85%

In all these tests, both groups showed a wide range of ability, but the range is considerably wider for the 2B pupils. At mid-year, there were three pupils in 2B and four in 1A who could be considered as having made little progress and there were about six in the former who scored rather consistently higher than the *best* scores in 1A, except in the mimeographed paragraph reading test. The 1A group, in other words, moved ahead somewhat more slowly and uniformly than the more experienced 2B.

Three independent observers of the two classes at this time reported as follows: (1) No obvious difference in reading interest between the two groups; (2) Oral expression better in 2B; (3) No obvious differences in general reading ability (according to two, one voting slightly better in 2B); (4) Greater maturity, poise, purposefulness in 2B; 1A more docile, less individualistic.

FINAL TESTS

For final tests, different forms of the Gates Primary Word Recognition and Paragraph Reading tests, and a test of recognition of words taught to both groups and a list of paragraph reading composed of words taught were used. Unforeseen circumstances, however, made the results of Gates Type 1 unusable. The data for the other June tests are given in Table II.

The pupils with the advantage of a half year in school excel in all three tests. Although the differences on the standardized test is not statistically reliable, the advantages in the two tests based on words used in the basal course during the year are highly reliable.

The percentage of 2B pupils equalling or exceeding the median score of the 1A group are as follows:

Recognition of words taught	85%
Reading of paragraphs based on words taught	75%
Gates Primary, paragraph reading	75%

Inspection of the scores reveals the fact that the 2B group secures a greater range, chiefly by running to higher levels. This is most conspicuous in the reading of paragraphs based on words used, which is probably the most important and revealing test. The 1A class clusters between 4 and 10 paragraphs correct; only one pupil securing a higher score, 18. In the 2B class, 12 pupils exceed score ten; they range from 11 to a perfect score, 23. In neither group did a child fail to score in this test. In 1A the lowest score was 4 paragraphs, in 2B, five.

TABLE II

RESULTS OF THE YEAR-END TESTS

	2B	1A	Diff.	S.D. Diff.
Recognition of words taught	23.8	13.0	10.8	1.9
Reading of paragraphs (words taught)	12.6	7.2	5.4	0.9
Gates Primary, Paragraph Reading	1.77	1.64	0.13	0.11

In general, it is clear that as a group the pupils who had the advantage of a half-term of pre-reading schooling reveal a superiority at mid-year which becomes more pronounced at the end of the year. The means are higher; fewer pupils obtain very low scores; three-quarters exceed the median of the other group and a larger number reach the higher levels of reading ability. The other side of the picture must also be noted; some children in the 1A group learned to read very well and some in the 2B read rather poorly at the end of the first year.

That a term of education of the type employed in the 2B class, together with the advantage of a half year of additional age and nearly a half year higher mental age enables dull-normal, underprivileged, socially, physically and emotionally inferior children to learn to read better than similar pupils when they enter school, seems reasonably certain. Two other questions, however, remain unanswered: whether, despite their slower progress, these pupils should not begin reading during the first

term and whether, despite their relatively better progress, those enjoying a first term of a "non-reading" activity program might be better off if they had another term or more of similar education. We have insufficient evidence to answer either question with certainty but we shall venture an opinion based on such data as we have.

Of the two questions, we answer the first with greater confidence. We think the data indicate that it is better for these children to have a varied program of enrichment and adjustment activities without formal instruction in reading (or in writing, arithmetic and other subjects) for the first term, at least. Although these pupils enjoyed reading, we believe there are many more enjoyable activities on which the time might have been spent. Reading presents more difficulties and subtleties of an intellectual and academic type, we believe, than these children should contend with at this early stage. Too large a proportion remain on a shaky and uncertain reading foundation for several months, some until near the end of the year. They have difficulty adjusting themselves to different types of material (blackboard, placards, typewritten, printed content) and material containing new words. Thus, for example, they appeared to be poorer readers on the unfamiliar Gates Primary tests than their reading in class indicated. Ability to adapt to new material, however, must be considered as a test of the value of reading instruction. On the final test with the Gates Paragraph Reading Test, 25 percent received a grade score of 1.75 or better. These may be considered as having shown a fairly satisfactory outcome. Sixty percent scored a reading grade of 1.60 or 1.65. This is the modal achievement on the standardized test. It is really quite good, all limitations of the pupils considered, but it is doubtful that it is the most profitable investment of time.

Whether reading should be delayed more than a term (or more exactly a term plus substantially two months) for such pupils is less easy to decide. On the Gates Primary Paragraph Reading test, the 2B group had a mean grade score of 1.77, a median of 1.80. Since the norm for this test at the time the examination was given would be about 1.88 and the mean I.Q. is .87, the "expected" or "typical" reading grade for this class would be 1.88 x .87, or 1.766, which is exactly the mean achievement and approximately the median. When the unusual deficiencies suffered by these pupils are considered, it may be said that, after a term of general education without reading, they did *relatively* well in learning. Whether reading this early was *absolutely* desirable—better than further

education similar to that of the preceding term, may be decided by the reader on the basis of values assigned to different educational outcomes. The writers, in the light of all the limitations and special needs of these children, are inclined to think that a full year of time might profitably have been spent in activities designed to help these handicapped pupils understand and adapt themselves to each other, their homes, parents and companions and the complex city environment in which they lived, and to their school, without formal instruction in the skill subjects. The problem, however, is one which must be solved, not by opinions, but by further experimentation with various types of programs covering longer periods of instruction.

Probably the most significant outcomes of the experiences with these children are the data obtained from more detailed case studies of the pupils in the two groups, especially those who were least successful in learning to read. These data, which point convincingly to the fact that the main sources of difficulty in learning are individual problems which must be solved as such and which are, in most cases, not removed by *mere* delay in beginning reading, will be presented in another report.

A STUDY OF THE CALIFORNIA TEST OF MENTAL MATURITY: ADVANCED BATTERY

ARTHUR E. TRAXLER
Educational Records Bureau

NATURE OF THE TEST

THE California Test of Mental Maturity is one of the newer intelligence tests which has attracted wide attention within the last year or two. An important reason for the interest in it is that it attempts to make a diagnostic measurement of mental functions. The test is designed to measure the following types of mental ability: memory, spatial relationships, reasoning, and vocabulary. Each of these parts contains several sub-tests. The test yields three intelligence quotients—an IQ for language factors and an IQ for non-language factors, as well as the usual type of IQ based on total scores. The IQ for language factors is based on tests of delayed recall, number quantity, inference, and vocabulary. The IQ for non-language factors results from tests of immediate recall, sensing right and left, manipulation of areas, foresight in spatial relations, opposites, similarities, analogies, number series, and number quantity.

PURPOSE AND METHOD OF THE PRESENT STUDY

An appraisal of the language and non-language intelligence quotients should be of considerable interest because of the possible value of the non-language IQ in the study of reading disability cases. With the marked growth of interest in remedial reading, the need for a group measurement of mental ability that will not be influenced by reading ability has become acute.

The present study investigates the reliability of the California test, the relationship between the language and non-language IQ's, the correlation of the California test with other tests of mental ability, and the relation of each type of IQ to reading ability. The study is based on the scores made in the fall of 1937 by ninety-five pupils in Grades VIII and IX of an independent school for boys. Twenty-one of the boys were in Grade VIII and seventy-four of them were in Grade IX. About the same time, these boys also took the American Council on Education Psychological Examination, the Iowa Silent Reading Test, and the Traxler Silent Reading Test. Several months earlier a number of the boys in

Grade IX had had the Kuhlmann-Anderson Intelligence Test. Thus, data were available for a comparative study of a variety of factors.

FINDINGS OF THE STUDY

Reliability of the California Test.—On the basis of the scores of seventy-four ninth grade pupils, reliability coefficients were found for total mental factors, language factors, non-language factors, memory, spatial relationships, reasoning, and vocabulary. Odd-numbered items were correlated with even-numbered items and the reliability of the whole test was estimated by means of the Spearman-Brown formula. This was the method used by the authors in finding the reliability coefficients reported in the manual of directions for the test. The reliability coefficients found in this study and also those given for Grade IX in the manual of directions are shown in Table I.

TABLE I

RELIABILITY COEFFICIENTS FOR THE CALIFORNIA TEST OF MENTAL MATURITY

	This Study	Test Manual
Total mental factors	.917	.949
Language factors	.911	.913
Non-language factors	.860	.931
Test A—Memory	.814	.920
Test B—Spatial Relationships	.650	.871
Test C—Reasoning	.837	.902
Test D—Vocabulary	.910	.886
Number of pupils	74	100

The correlations found in this study are lower than the correlations given in the manual of directions except in language factors and vocabulary. The difference is much larger in the spatial relationships section than in the other parts of the test. The tendency for the correlations to run lower in the present study than in the study reported by the publishers occurs notwithstanding the fact that the variability in the mental ages of the group on which this study was based is greater than the variability in the mental ages of the cases used by the publishers. The standard deviation in the mental ages reported by the publishers for the ninth grade group is 17.5, while the standard deviation of the mental ages of the ninth grade group used in the present study is 24.6. The sigmas of the scores used in finding the correlations are not reported in the manual of directions.

The findings in the present study indicate that total mental factors, language factors, and Test D—Vocabulary are very reliable and that non-

language factors are also fairly reliable. Test A—Memory—and Test C—Reasoning—should be of some value in individual diagnosis although they do not appear to be highly reliable. The correlation found in this study for Test B—Spatial Relationships suggests that this part has sufficient reliability for group studies but indicates that it has very little value for the study of individuals. It also raises a question about the usefulness of the diagnostic profile, for it may reasonably be assumed that the subtests within the section, since they are still shorter, will be even less reliable. Further study of the reliability of the spatial relations section with a larger number of cases is needed.

Relationship between IQ's based on language factors and IQ's based on non-language factors.—Two types of comparison may be made between the language and non-language IQ's secured with the California test. One kind of comparison results from correlations of the language IQ's and the non-language IQ's and the other is based on the medians and the spread of the distributions of the IQ's.

The correlations of language IQ's and non-language IQ's are as follows:

Grade	Number	r	P.E.
8	21	.565	± .010
9	74	.618	± .048

The correlation coefficients are positive and significant, but they are lower than the correlations ordinarily found between two different mental tests. The correlations indicate that a good many pupils may be relatively high in one kind of IQ and relatively low in the other kind. Obviously, the language and non-language portions of the California test measure abilities that are by no means identical. On the basis of the correlations found, it therefore seems desirable to use these scores separately.

The median and the Q, or one-half the interquartile range, for each type of IQ are shown in Table II.

TABLE II

MEDIANS AND Q'S OF LANGUAGE AND NON-LANGUAGE IQ'S OF PUPILS IN GRADES VIII AND IX OF AN INDEPENDENT SCHOOL FOR BOYS

	Median		Q	
	Grade VIII	Grade IX	Grade VIII	Grade IX
Language IQ	120.5	122.7	14.2	17.5
Non-Language IQ	105.5	110.4	8.8	11.4
Difference	15.0	12.3	5.4	6.1

In each of the grades, the median IQ based on language factors is much larger than the median IQ derived from non-language factors. The difference is fifteen points in Grade VIII and more than twelve points in Grade IX. This seems somewhat surprising in view of the fact that the median IQ for an unselected group should be 100, regardless of the tests on which it is based. It probably may be expected that the selection of boys in a private school is in favor of the language factors, since the relatively high cultural background from which the pupils are drawn makes for facility in language, but in view of the very large difference in medians, it is logical to raise a question about the procedures used in the standardization of the two types of IQ.

The variability in the language IQ's is also definitely greater than the variability in the non-language IQ's. The explanation of this difference is not apparent. It may be due to some undiscovered element in the selection of the cases; if, however, it should prove to be typical of the distributions for the two kinds of IQ, it is obvious that the interpretation of the different IQ's should be made only in the light of the differences in variability as well as the difference in medians.

Correlations between the California Test of Mental Maturity and the American Council Psychological Examination.—The correlations of language factors, non-language factors, and total mental factors on the California test with total scores on the American Council Psychological Examination[1] are shown in Table III.

TABLE III

CORRELATION OF SCORES ON THE CALIFORNIA TEST OF MENTAL MATURITY WITH SCORES ON THE AMERICAN COUNCIL PSYCHOLOGICAL EXAMINATION

	Grade VIII			Grade IX		
	Number	r	P.E.	Number	r	P.E.
Total Mental Factors vs. American Council Psychological	21	.823	± .048	73	.728	± .037
Language Factors vs. American Council Psychological	21	.801	± .053	73	.773	± .032
Non-Language Factors vs. American Council Psychological	21	.690	± .077	73	.476	± .061

The correlations between total mental factors on the California test and total scores on the American Council Psychological Examination compare favorably with the correlations usually found between two different tests of mental ability. The correlations for language factors and

[1] This was the college edition of the American Council Psychological Examination. This test is, of course, much too hard for use in Grades VIII and IX of the average school, but it was suitable for use in this school because the pupils tended to be relatively high in mental ability.

American Council scores are also relatively high; in fact, in Grade IX the correlation in which language factors are used is slightly higher than the correlation using total mental factors. The correlations for non-language factors and the American Council scores are significantly lower than the other correlations. However, this is to be expected since three of the five parts of the American Council test are largely verbal and the other two parts make some use of language.

Correlations of IQ's on the California Test with Kuhlmann-Anderson IQ's.—Approximately a year before they had the California Test of Mental Maturity, thirty-one of the ninth grade pupils took the Kuhlmann-Anderson Test, which contains sub-tests involving both language and non-language factors. The correlations of the IQ's on the two tests are as follows:

Kuhlmann-Anderson vs. California Total Mental Factors	$.813 \pm .042$
Kuhlmann-Anderson vs. California Language Factors	$.769 \pm .049$
Kuhlmann-Anderson vs. California Non-Language Factors	$.737 \pm .055$

These correlations compare favorably with the correlations of other intelligence tests with the Kuhlmann-Anderson test when the tests are administered a year apart. For example, the average of the correlations found recently for the Kuhlmann-Anderson test and the Otis Self-Administering Test of Mental Ability taken by four different groups of pupils was .750.

The differences that do exist between the results of the California test and the results of the Kuhlmann-Anderson test and the American Council Psychological Examination are due partly to the fact that these three tests, like all other tests, are not perfectly reliable. If each of the tests had a reliability of 1.00 the agreement between the results of the California test and the results of the other two tests would be very close indeed. It appears, therefore, that if the tests which the Bureau has used recently in its regular testing programs are accepted as valid instruments for the measurement of intelligence, the California test—or at least the total mental factors in the test—is valid to the extent that it places pupils in about the same relative positions with respect to one another that they are placed by the other tests. This statement is of course tentative, since the present study is limited to a small number of cases in only two grades.

Correlations of language factors and non-language factors with two reading tests.—It is reasonable to expect that if the distinction between the language factors and the non-language factors is a real one, the rela-

tionship of the language IQ's to reading ability will be significantly higher than the relationship between non-language IQ's and ability to read. In an examination of the validity of the California test the correlations of these IQ's with reading test scores are therefore of considerable interest. The correlations between each type of IQ and scores on the Iowa Silent Reading Test and the Traxler Silent Reading Test are shown in Table IV.

TABLE IV

CORRELATION OF LANGUAGE IQ'S AND NON-LANGUAGE IQ'S WITH TOTAL SCORES ON TWO READING TESTS

	Grade VIII			Grade IX		
	No. of Cases	r	P.E.	No. of Cases	r	P.E.
Language Factors vs. Iowa Silent Reading	21	.685	± .079	74	.685	± .041
Non-Language Factors vs. Iowa Silent Reading	21	.513	± .109	74	.356	± .068
Language Factors vs. Traxler Silent Reading	21	.758	± .062	74	.753	± .034
Non-Language Factors vs. Traxler Silent Reading	21	.443	± .119	74	.357	± .068

Table IV provides consistant evidence that the relationship between the language IQ's and reading ability is significantly higher than the relationship between the non-language IQ's and reading ability. In fact, the correlations between the non-language IQ's and the reading test results for Grade IX, which because of the size of the group are considerably more reliable than the correlations for Grade VIII, show unusually low relationship between reading ability and the non-language factors. This is one of the most important and encouraging findings made in this study. The finding suggests that the marked need for an intelligence test that is free from the influence of reading ability may be met by the non-language part of the California test.

Relative size of language IQ's and non-language IQ's for varying levels of reading ability.—One would naturally expect that the language IQ's of excellent readers would tend to be superior to their non-language IQ's and that the reverse would be true of the pupils whose reading ability is low. Is this actually the case? In order to investigate this question, the ninth grade was divided into fourths according to average reading skill on the Iowa and Traxler tests, and the median language IQ and median non-language IQ for each group were found. These data are shown in Table V.

TABLE V

MEDIAN LANGUAGE IQ'S AND MEDIAN NON-LANGUAGE IQ'S FOR GROUPS REPRESENTING VARYING LEVELS OF READING ABILITY

	No of Cases	Median	Difference
Highest quarter			
Language IQ	19	147.0	32.0
Non-Language IQ	19	115.0	
Upper middle quarter			
Language IQ	19	144.6	30.1
Non-Language IQ	19	114.5	
Lower middle quarter			
Language IQ	18	116.0	12.0
Non-Language IQ	18	104.0	
Lowest quarter			
Language IQ	18	103.3	4.3
Non-Language IQ	18	99.0	

Table V shows that the relative size of language and non-language IQ's varies with reading ability. The language IQ's of the superior readers are, on the average, much higher than their non-language IQ's, while the difference is quite small for the pupils in the lowest quarter of the group in reading skill. However, even in the lowest group the average language IQ is more than four points above the average non-language IQ. At first thought, it does not seem reasonable that pupils who are relatively low in one of the most important aspects of language ability—namely, reading—should tend to be higher in language IQ then in non-language IQ. It should be remembered, however, that these private school boys were, as a group, definitely superior in reading achievement, and that most of the boys in even the lowest quarter had reading scores above the public school norm. In other words, the lowest quarter of the class, as a group, did not have inferior reading skill, in comparison with unselected ninth grade pupils. It is therefore not surprising to find that their average language IQ was a little above their average non-language IQ. The question needs further study with a group that includes some pupils with very low reading ability.

On the whole, the data presented in this study are favorable to the reliability, validity, and utility of the California test.

CONSTANCY OF ERRORS TO BASIC FACTS IN THE FUNDAMENTAL OPERATIONS IN ARITHMETIC

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THIS study was made to determine the constancy of an error to a basic fact in the four fundamental operations in arithmetic. There is some experimental evidence to indicate that many errors made in arithmetic are sporadic and due to chance rather than to a faulty knowledge. An error due to chance is known as a chance error and it is not constant. An error due to a faulty knowledge should be persistent and constant. A test containing only one response to a combination would not differentiate between a sporadic and a constant error.

One of the first studies to show that an error is not always constant was made by Brueckner and Ewell.[1] This study used fractions instead of basic combinations. The results indicated that at least three examples of the same type had to be offered in a test to see if an error were constant. Brueckner[2] further showed that errors to examples in division of fractions from a test taken six different times were largely due to chance. The senior writer[3] showed that a multiplication fact in division had to occur at least three times before the effect of chance could be determined in diagnosing the results.

Ruch showed that a pupil's score made on a test of basic facts in addition is a variable. He arranged the one hundred addition facts in random sequences on five different forms and gave these tests to thirty pupils in Grade III. There was not one case in which a pupil made the same score on all of the five forms.[4] This variation must have been due to chance errors. The investigation reported in the following pages is a more exhaustive study than that reported by Ruch for each of the four fundamental operations.

[1] Brueckner, Leo. J., and Ewell, Mary. "Reliability of Diagnosis of Error in Multiplication of Fractions," *Journal of Educational Research*, XXVI (November, 1932), pp. 175-185.

[2] Brueckner, Leo. J. "Persistency of Error as a Factor in Diagnosis," *Education*, LVI (November, 1935), pp. 140-144.

[3] Grossnickle, Foster E. "Reliability of Diagnosis of Certain Types of Errors in Long Division with a One-Figure Divisor," *Journal of Experimental Education*, IV (September, 1935), 7-16.

[4] Ruch, G. M. *The Objective or New Type Examination* (Chicago: Scott, Foresman and Co., 1929), pp. 49-50.

The basic facts in the four operations were given to approximately one hundred pupils in each of Grades IV-VIII, inclusive. Each pupil took the test in each operation five different times after an interval of one or two days between successive tests. The pupil was not shown his paper between test periods and there was no class discussion of results. No encouragement was given to have the pupil better his score at different test periods.

The facts in addition and subtraction were arranged on two tests from easiest to most difficult, twice in the reverse order, and once in a random sequence determined by the order in which a fact was drawn from a hat. The Knight-Behrens[5] list of order of difficulty was used.

The 90 facts in multiplication, 81 significant facts and 9 zero facts,[6] were arranged on the five tests in a similar manner to the addition and subtraction combinations. The order of difficulty for the multiplication facts was that given by Norem and Knight.[7]

The arrangement for the five forms of the division facts was based on the order of the corresponding multiplication facts. For the multiplication fact, $6 \times 9 = 54$, the corresponding division fact is $54 \div 6$.

The results from the tests are given in Tables I to IV, inclusive. The significant facts (those not containing zero) are considered separately from those containing zero.

A record was kept of a pupil's response to each fact on the five different tests in the four processes. If an error was made to a combination as, $5 + 6$, on the first test, the results to this same fact were considered on the four remaining tests. If the same fact, $5 + 6$, was answered correctly on the first test but incorrectly on the second, then the initial error occurred on the second test.

Table I for the addition facts shows the number of initial errors made on each of the five tests. It also shows the number of these errors which occur but once, twice, and three or more times to a given fact. Of course if an initial error occurs on the fourth test, that error could appear but once more, namely on the fifth test. Since the test was given five times, an initial error appearing on the fifth test could occur but once.

[5] Knight, F. B., and Behrens, M. S. *The Learning of the 100 Addition Combinations and the 100 Subtraction Combinations* (New York: Longmans, Green and Co., 1928), pp. 16-20, 29-33.

[6] Grossnickle, Foster E. "Still More Ado About Zero," *Elementary School Journal*, XXXIII (January, 1933), pp. 358-363.

[7] Norem, G. B., and Knight, F. B. "The Learning of the One Hundred Multiplications," *The Twenty-Ninth Yearbook of the National Society for the Study of Education* (Bloomington, Illinois: Public School Publishing Co., 1930), pp. 555-557.

TABLE I

CONSTANCY OF ERRORS TO THE ADDITION FACTS

Grade		TEST 1					TEST 2					TEST 3					TEST 4			TEST 5	
	No. Cases	Total No. Errors	Once	Twice	Three or More Times	Percent of Constancy	Total No. Errors	Once	Twice	Three or More Times	Percent of Constancy	Total No. Errors	Once	Twice	Three Times	Percent of Constancy	Total No. Errors	Once	Twice	Total No. Errors	Once
IV	92	*57	37	10	10	17.5	77	59	6	12	15.9	36	33	3	0	0.0	76	73	3	85	85
		†32	8	1	23	72.0	6	3	0	3	50.0	9	9	0	0	0.0	1	1	0	5	5
V	69	*52	38	7	7	13.4	40	30	10	0	0.0	38	34	3	1	2.6	57	53	4	46	46
		†38	5	0	33	87.0	5	0	1	4	80.0	6	0	0	6	100.0	0	0	0	3	3
VI	73	*34	29	5	0	0.0	30	28	2	0	0.0	23	23	0	0	0.0	18	17	1	36	36
		†1	1	0	0	0.0	1	1	0	0	0.0	2	2	0	0	0.0	0	0	0	1	1
VII	111	*59	40	13	6	10.1	64	57	6	1	1.6	40	31	9	0	0.0	36	35	1	66	66
		†2	2	0	0	0.0	0	0	0	0	0.0	5	4	1	0	0.0	3	3	0	4	4
VIII	109	*23	22	1	0	0.0	32	30	2	0	0.0	21	19	2	0	0.0	16	15	1	24	24
		†1	1	0	0	0.0	1	1	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0
TOTAL	454	*225	166	36	23	10.2	243	204	26	13	5.3	158	140	17	1	0.6	203	193	10	257	257
		†74	17	1	56	75.6	13	5	1	7	53.7	22	15	1	6	27.2	4	4	0	13	13

* Significant Facts
† Zero Facts

TABLE II

CONSTANCY OF ERRORS TO THE SUBTRACTION FACTS

Grade	No. Cases	TEST 1					TEST 2					TEST 3					TEST 4				TEST 5	
		Total No. Errors	Once	Twice	Three or More Times	Percent of Constancy	Total No. Errors	Once	Twice	Three or More Times	Percent of Constancy	Total No. Errors	Once	Twice	Three Times	Percent of Constancy	Total No. Errors	Once	Twice	Total No. Errors	Once
IV	92	*170	87	14	69	40.5	89	41	5	43	48.4	100	82	5	13	13.0	36	35	1	72	72
		†74	20	0	54	73.0	0	0	0	0	0.0	2	2	0	0	0.0	1	1	0	2	2
V	69	*106	39	11	56	52.8	64	44	10	10	16.5	43	39	3	1	2.3	59	58	1	53	53
		†10	1	0	9	90.0	36	17	7	12	33.3	10	7	2	1	10.0	9	4	5	0	0
VI	73	*89	74	7	8	11.1	38	33	3	2	5.3	31	27	4	0	0.0	23	23	0	13	13
		†13	12	1	0	0.0	1	1	0	0	0.0	1	1	0	0	0.0	3	3	0	0	0
VII	111	*79	48	15	16	20.2	87	67	11	9	10.4	65	60	4	1	1.5	48	44	4	34	34
		†10	1	9	0	0.0	0	0	0	0	0.0	5	5	0	0	0.0	2	2	0	2	2
VIII	109	*41	34	6	1	2.4	75	69	5	1	1.3	36	35	1	0	0.0	33	33	0	18	18
		†4	4	0	0	0.0	0	0	0	0	0.0	1	1	0	0	0.0	1	1	0	0	0
TOTAL	454	*485	282	53	150	30.9	353	254	34	65	18.4	275	243	17	15	5.5	199	193	6	190	190
		†111	38	10	63	56.9	37	18	7	12	32.5	19	16	2	1	5.3	16	11	5	4	4

* Significant Facts
† Zero Facts

TABLE III

CONSTANCY OF ERRORS TO THE MULTIPLICATION FACTS

Grade	No. Cases	TEST 1					TEST 2					TEST 3					TEST 4			TEST 5	
		Total No. Errors	Once	Twice	Three or More Times	Percent of Constancy	Total No. Errors	Once	Twice	Three or More Times	Percent of Constancy	Total No. Errors	Once	Twice	Three Times	Percent of Constancy	Total No. Errors	Once	Twice	Total No. Errors	Once
IV	96	*307	104	39	164	53.5	158	61	43	54	34.2	104	69	27	8	7.7	93	76	17	87	87
		†56	11	6	39	66.0	30	3	7	20	66.7	29	13	8	8	27.6	8	6	2	18	18
V	70	*213	63	29	121	56.7	101	51	16	34	33.6	57	43	10	4	7.0	41	39	2	57	57
		†68	7	6	55	81.0	31	13	3	15	48.5	36	17	11	8	22.2	7	6	1	3	3
VI	74	*13	5	3	5	38.4	19	16	2	1	5.4	60	48	11	1	1.4	24	23	1	31	31
		†37	7	3	27	72.9	11	7	4	0	0.0	9	7	2	0	0.0	2	2	0	3	3
VII	106	*84	36	10	38	45.3	49	32	8	9	18.3	41	31	6	4	9.7	45	37	8	51	51
		†189	96	34	59	31.2	37	13	14	10	27.0	33	19	4	0	0.0	6	6	0	5	5
VIII	106	*69	61	5	3	4.4	7	7	0	0	0.0	10	10	0	0	0.0	23	22	1	38	38
		†94	64	4	26	27.7	4	3	1	0	0.0	9	4	5	0	0.0	5	5	0	9	9
TOTAL	452	*686	269	86	331	48.3	334	167	69	98	29.3	272	201	54	17	6.2	226	197	29	264	264
		†444	185	53	206	46.4	113	39	29	45	39.8	106	60	30	16	15.1	28	25	3	38	38

* Significant Facts
† Zero Facts

TABLE IV

CONSTANCY OF ERRORS TO THE DIVISION FACTS

Grade		TEST 1					TEST 2					TEST 3					TEST 4			TEST 5	
	No. Cases	Total No. Errors	Once	Twice	Three or More Times	Percent of Constancy	Total No. Errors	Once	Twice	Three or More Times	Percent of Constancy	Total No. Errors	Once	Twice	Three Times	Percent of Constancy	Total No. Errors	Once	Twice	Total No. Errors	Once
IV	96	*668	195	115	358	53.7	239	117	38	84	35.2	146	115	22	9	6.2	42	33	9	135	135
		†48	12	4	32	66.7	12	9	0	3	25.0	6	5	1	0	0.0	2	2	0	4	4
V	70	*333	123	32	178	53.5	188	95	36	57	30.3	121	71	31	19	15.7	49	37	12	54	54
		†57	10	9	38	66.8	9	7	2	0	0.0	5	1	4	0	0.0	6	3	3	1	1
VI	74	*165	123	12	30	18.2	68	58	6	4	5.9	92	88	4	0	0.0	44	41	3	37	37
		†67	55	1	11	16.4	6	5	1	0	0.0	2	2	0	0	0.0	3	3	0	1	1
VII	106	*208	101	29	78	37.6	158	92	13	53	33.6	63	51	5	7	11.1	74	64	10	34	34
		†11	3	1	7	63.6	4	2	0	2	50.0	2	2	0	0	0.0	1	1	0	11	11
VIII	106	*121	104	14	3	2.5	36	24	7	5	13.9	56	53	1	2	3.6	41	40	1	35	35
		†5	5	0	0	0.0	0	0	0	0	0.0	10	10	0	0	0.0	1	1	0	1	1
TOTAL	452	*1495	646	202	647	43.2	689	386	100	203	29.5	478	378	63	37	7.7	250	215	35	295	295
		†188	85	15	88	46.8	31	23	3	5	16.2	25	20	5	0	0.0	13	10	3	18	18

* Significant Facts

† Zero Facts

Read Table I: In Grade IV, there were 92 pupils who made 57 different errors to the significant facts in which 37 appeared but once, 10 appeared in one of the four remaining tests, and 10 appeared at least twice in the four remaining tests. Assuming that an error must appear three or more times to be constant, in 17.5 percent of cases the errors were persistent. There were 77 initial errors on the second test in which 59 appeared but once, 6 appeared twice, and 12 appeared on at least two of the three remaining tests. In 15.9 percent of the cases, the errors were constant or persistent. On the third test, there were 36 initial errors in which 33 appeared but once, 3 appeared on one of the two remaining tests, and none on both. The percent of constancy of errors was zero. On the fourth test, there were 76 initial errors, of which 73 appeared but once and 3 appeared on the following test. For the fifth test, there were 85 initial errors.

In Grade IV for the zero facts, there were 32 initial errors on Test 1 in which 8 occurred but once in the four following tests, 1 occurred twice, and 23 occurred three or more times. In this case, 72.0 percent of the errors were constant. The remainder of the table is read in a manner similar to the scheme given above.

Tables II-IV are read in a similar manner.

The percentage of reliability in each of the previous tables was determined by dividing the number of errors which appeared three or more times on the five tests by the total number of errors made on these tests. The absolute consistency of an error was determined by finding how many errors appeared on all five tests in a given process. The number of errors and the number of pupils making these errors are given in Table V.

TABLE V

NUMBER OF PUPILS AND NUMBER OF FACTS MISSED ON ALL FIVE TESTS FOR EACH BASIC PROCESS

Grade	Addition		Subtraction		Multiplication		Division	
	No. of Facts	No. of Pupils	No. of Facts	No. of Pupils	No. of Facts	No. of Pupils	No. of Facts	No. of Pupils
IV	†0	0	6	4	14	6	103	11
	‡12	2	34	4	32	7	17	8
V	†0	0	14	1	54	11	87	8
	‡18	2	9	3	32	8	15	6
VI	†0	0	0	0	0	0	4	4
	‡0	0	0	0	27	3	9	1
VII	†0	0	1	1	6	1	18	4
	‡0	0	0	0	33	7	7	3
VIII	†0	0	0	0	0	0	0	0
	‡0	0	0	0	8	2	0	0
Total	†0	0	21	6	74	18	212	27
	‡30	4	43	7	132	27	48	18

† Significant Facts
‡ Zero Facts

Table V shows that none of the errors to the significant facts in addition was constant five times and only 21 for the significant facts in

subtraction. The zero facts in these two processes maintained a high percentage of constancy.

For multiplication and division, the constancy of the errors to the significant facts was greater than for the other two processes. Even in multiplication and division, there were only three cases in which as many as one third of the errors to the significant facts marked constant in Tables III and IV were constant in Table V. These results challenge the statement that three repetitions of a test are sufficient to remove the factor of a chance error in the result.

A study of Tables I to V, inclusive, shows the following things:

1. Most of the errors to the significant facts in addition and subtraction were sporadic. A diagnosis made from the results of one test in these two processes would be very unreliable.

2. In each of the five grades tested, chance errors occurred to the significant facts in all four operations. On the whole, there were fewer errors in the advanced grades than in the earlier grades. However, the decrease in the number of errors from grade to grade was not uniform. In the advanced grades, the percentage of constant errors was very small.

3. The errors to the significant facts in multiplication and division were more constant than for the other two processes. If a constant error is defined as one which must persist on five different tests, there was a small percentage of persistence to these facts.

4. There was a much greater number of chance errors made to the significant facts in division than in multiplication. The percentage of persistent errors in the two processes was about the same.

5. The data in Table V indicate that an error to a significant fact may be constant on three forms of a test but not on five forms. Therefore, a reliable diagnosis of an error of this kind may not be made from the results of a test which was given only three times.

6. The errors to the zero facts in addition and subtraction were constant in about three out of four cases.

7. The zero facts in addition and subtraction were learned about the sixth grade level. From that point, there were no persistent zero errors and few which were sporadic. From these results, it may be concluded that the pupils learned the function of zero in a combination.

8. The errors to the zero facts in multiplication persisted through Grade VIII, and in division through Grade VII. The zero facts in multiplication were more difficult than those in division.

9. The results indicate that there is not a complete transfer of the knowledge of zero in the addition and subtraction facts to the function of zero in the multiplication and division facts.

10. The small percentage of initial errors to zero facts on Tests 2, 3, 4, and 5 indicates that most of these initial errors appeared on Test 1. In over 60 percent of the cases, if an error to a zero fact occurred on three tests, it was constant on all five tests for a given basic process. Therefore, a reliable diagnosis may usually be made from the results of a test in which a zero fact appears but once.

THE EFFECT OF WRITTEN TESTS UPON ACHIEVEMENT IN COLLEGE CLASSES: AN EXPERIMENT AND A SUMMARY OF EVIDENCE*

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THE PROBLEM

THE available evidence on methods of motivating college and university students to high standards of accomplishment in academic work is not extensive. The value of various incentives with younger pupils has been more widely and carefully studied. The instructor in higher institutions is often a specialist in a particular field and is apt to depend on his learning rather than on his pedagogical skill to "put his subject across." There is one type of classroom activity, however, which is rather generally used with college students at least in part for purposes of motivation. The activity referred to is the written quiz or test.

A perusal of pedagogical literature leads one to the conclusion that most teachers believe occasional short quizzes to have a salutary effect on learning. Among the valuable outcomes of tests and quizzes frequently mentioned by writers on the subject is that they stimulate pupils to do better work, because the knowledge that a test is imminent motivates them to greater and more consistent effort. It is also said that a pupil learns something in taking tests, and that the results when made available to him help him to improve. (14). There is substantial evidence from psychological literature to support the principle that practice with knowledge of results makes for higher achievement than practice without such knowledge.

THE AVAILABLE EVIDENCE

As stated above more evidence is available on methods of motivating younger pupils than older ones. However, a number of studies have been made of the effect of short written quizzes on achievement in certain college courses. The reports of all investigations of this question that could be located in published literature will be reviewed. A few of more than ordinary excellence made with secondary school pupils will also be mentioned.

* Much of the calculation in this experiment was done by Virginia R. Davis, graduate student in education.

Turney (12) conducted an experiment with two classes in educational psychology, one having frequent short objective tests while the other had but two such tests during the semester. The first-mentioned class, on a pre-test covering the subject matter of the course, had an average score substantially lower than that of the other group. At the end of the course the two were practically equal in achievement. Whether the greater gain of the experimental group was the result of more frequent tests is not certain. The groups were not equated.

White (13) divided three sections in general psychology into control and experimental groups by taking alternate members of the three classes. All students took a weekly true-false quiz. Those designated as controls were told that their mark in the course would be based wholly on their work in the weekly quizzes. The experimental group was told that they would have a final examination made up entirely of the weekly quizzes and that their mark in the course would be based equally on quizzes and on the final examination. All weekly quizzes were scored and returned to the students. Just before the final examination the control group was asked to take the final examination, also. They were asked to coöperate in the experiment by doing their best, even though it would not count, and they were told that the scores would be posted. The results showed that the groups were equal in their average scores on the weekly quizzes but on the final examination the experimental group was well ahead of the control group. These results seem to indicate that the experimental group studied the quizzes knowing that the final examination would be based on them, while the control group probably paid no further attention to them after they had taken them, secure in the feeling that they would have no further need for the information.

Hertzberg, Heilman and Leuenberger report an investigation (4) of the value of objective tests as teaching devices in a course in educational psychology. Two groups matched in scholastic aptitude were the subjects. One group had a test every third day which was scored and returned to them. They were permitted to keep these until just before the final examination. The other group had no quizzes (at least so one infers from the report). In achievement, measured on one unit, and on five units, the tested group was superior, but on the final examination covering the entire course, the non-tested group was slightly superior.

Keys (6) conducted a study to determine the effect of weekly as opposed to monthly quizzes in a course in educational psychology. The

two classes took exactly the same test material and comprehensive examinations, but in one case the tests were broken up into short weekly exercises while in the other case they were given as longer tests covering a month's work. The results show reliable superiority for the group in which the tests were given as weekly exercises. The group tested weekly also surpassed the control group on a comprehensive examination given without warning. However, on the regular final examination the average scores of the two classes were practically equal.

Pressey (10) reports an investigation by Meltzer in which tests were used in a rather unique fashion. A class in educational psychology meeting five times per week took a 20-minute objective test every Thursday. The papers were scored and returned the next day with brief discussion. Those who made A or B were excused from class attendance for the following Monday at which time the work of the previous week was reviewed and a second test was given. The experimental and control groups were equal at the beginning of the quarter on a comprehensive pre-test, but the experimental group was superior at the end. Less able students seem to have benefited especially by the testing program.

Eurich (3) reports an investigation whose purpose was to determine the extent to which weekly examinations and emphasis upon improvement rather than final achievement motivate students in their study of psychology. Sixty-three students in the experimental group were matched on the basis of intelligence and initial test score with an equal number of students in the control group. In the experimental group the students were requested to chart their progress on the weekly tests and there was constant emphasis upon improvement. In the control group only initial or pre-test and final examination were used. No significant difference in final achievement or in improvement was found. The effect of tests showed no relation to ability of students.

Kulp (9) found that when graduate students in educational sociology were excused from weekly tests on the basis of having done well in such tests, their superiority over those who were in the lower half of the class almost disappeared. The results are inconclusive because of inadequate controls and a small number of cases.

Kitch (8) made a study to determine the extent to which the use of self-scored tests stimulate pupil learning in high school biology. At the close of each unit of work mimeographed objective tests were given after which the pupils scored their own papers. The achievement of this class on an examination covering four units of biology was compared with

that of a class which had taken the course the preceding semester but in which the unit tests had not been used. The group having had the unit tests showed achievement which was significantly better than that of the non-tested class.

Kirkpatrick (7) used 370 pupils as controls and 359 pupils as an experimental group in high school physics to determine the value of pretesting and specific instruction based on the test results. In the control group the tests were not used. All pupils took a comprehensive final examination consisting of alternate items to the ones used in the tests, but covering the same material. The experiment lasted 14 weeks. The groups were approximately equivalent in intelligence, ability in physics, grade, and average number of minutes per week spent in class work. The results show that the experimental group was consistently and often significantly superior on both immediate and delayed tests. The experimental group also showed some superiority on a special comprehensive examination given at the close of the experiment. Four months later this examination was given again at which time no differences were evident between experimental and control groups. Below-average pupils gained more from the testing and specific instruction than superior pupils seemed to do.

The evidence from these studies is inconclusive and raises more questions than it answers. On the whole, however, certain things seem to stand out, at least as suggestions, if not as definitely established facts.

First, it appears that the effect obtained differs according to the way in which tests results are used. If tests are used as a basis for specific remedial instruction the results seem beneficial. When the tests are returned after being marked, with no indication that they were used for instructional purposes, there is little evidence that this procedure has any great value. Furthermore, most studies on the college level show no effect whatever on final achievement when measured by comprehensive objective examinations, even when the test results are discussed with the students or when they are invited to use them for study purposes.

Second, there is a suggestion in one or two reports that less able or below average students are helped more by tests than those who are superior in accomplishment.

There is some indication, in the third place, that younger and less responsible students, as those in secondary schools, are more likely to be motivated and helped by quizzes than older students who are presumably more mature.

Finally, one study indicates that weekly quizzes are more helpful and stimulating than the same material used in larger (monthly) doses.

Most of the studies reported may be criticized from one or another of the usual standpoints, such as too small numbers, failure to equate groups, introducing more than one variable, and the like. In some cases students knew that an experiment was in progress when it would seem better to have encouraged them to feel that nothing unusual was happening.

THE EXPERIMENT

The investigation reported here was intended to throw additional light on the important question which has been raised, and to control conditions more effectively than most studies so far reported seem to have done.

The writer's two classes in educational psychology for the years 1935-36 and 1936-37 respectively were the subjects of the experiment. Achievement was measured in both classes by the same one-hour objective mid-semester examination, containing one hundred items, and a two-hour objective final examination, consisting of two-hundred items. The first is an examination dealing principally with the use and application of elementary statistical methods; the second is intended to cover the fundamental principles and applications of the introductory course in educational psychology.

In the class of 1935-36 four quizzes were given at intervals of about three weeks. In the experimental class, 1936-37, no quizzes other than the mid-semester and final examinations were given. The quizzes varied in length from fifteen minutes to an hour each. The average time required was about 30 minutes. They were semi-objective in nature and dealt with major fields such as learning, transfer of training, and the like. All were marked and returned to the students, and opportunity provided for discussion and answering questions if students desired it. It was intended that the quizzes should be taken as a routine matter and that no more or less emphasis should be placed on them than is usually done in such classes.

The mid-term and final examinations were not returned or discussed. However, a few students in each class came in after these examinations had been given and asked if they might see their papers. This request was always granted but no copies were taken out of the office and no notes on the examinations were permitted. A careful check was made of these papers at all times and no copies were ever lost so far as we are

aware. Comparison of the mean scores of the two classes shown in Table I bears out the belief that neither class had any previous knowledge of these examinations.

TABLE I

COMPARISON OF CLASSES OF 1935-36 AND 1936-37 ON MID-TERM AND FINAL EXAMINATIONS

	Mid-Term		Final	
	1935-36	1936-37	1935-36	1936-37
Mean	46.37	46.90	108.08	108.60
Standard Deviation	11.45	8.80	18.30	19.20
N	40	50	40	50
$M_1 - M_2$	— .53		— .52	
$S.E._{M_1 - M_2}$	3.05		5.62	
$\frac{M_1 - M_2}{S.E._{M_1 - M_2}}$	— .17		— .09	

The course in both classes was given in exactly the same way, insofar as possible. The classes met for one hour three times per week. The same textbook and instructor's outline were used, and both classes were taught entirely by the writer. The method used was largely lecture with some time for class discussion. No classes were told that an experiment was in progress and no attention was ever drawn to any difference in procedures with different classes. Since the classes were a year apart and there was only one repeater, it is unlikely that the students ever suspected that an experiment was being carried on. This, it seems to the writer, is an important point, which some of the studies reviewed failed to take into account or control.

Using the first class as a control and the second as the experimental group, individuals were matched on percentile rank on the American Council Psychological Test and on honor point ratio based on all previous work in college. This varied from 1½ to 3½ years work, but almost all were third- or fourth-year students. Thirty-three pairs were formed, the exactness of the equating of the two groups being shown in Table II.

It should be borne in mind in the comparisons to follow that the experimental group is the no-quiz group and the thirty-three members of the control group are from the two classes where occasional quizzes were given.

TABLE II

PERCENTILE RANK ON COLLEGE ABILITY TESTS AND HONOR POINT RATIO OF EQUATED GROUPS—THIRTY-THREE PAIRS

	P.R.C.A.T.		H.P.R.	
	Experimental	Control	Experimental	Control
Mean	54.09	55.30	1.58	1.60
Standard Deviation	25.80	27.50	.54	.49
$M_1 - M_2$	−1.21		−.02	
S. E. $M_1 - M_2$	9.29		.18	
$\frac{M_1 - M_2}{\text{S. E.}_{M_1 - M_2}}$	−.13		−.11	

The data in Table II show that the two groups were almost exactly equal in ability and scholarship.[1]

The achievement of the two groups of paired students as measured by the mid-term and final examinations is shown in Table III, together with the reliability of differences found.

TABLE III

ACHIEVEMENT AS MEASURED BY MID-TERM AND FINAL EXAMINATIONS—THIRTY-THREE PAIRS

	Mid-Term		Final	
	Experimental	Control	Experimental	Control
Mean	48.11	46.29	111.67	106.36
Standard Deviation	9.05	10.15	19.60	17.40
$M_1 - M_2$	1.82		5.31	
S. E. $M_1 - M_2$	3.35		6.45	
$\frac{M_1 - M_2}{\text{S. E.}_{M_1 - M_2}}$	.54		.82	

The results just presented show differences favoring the experimental or no-quiz group. They are both small and not very reliable, being little better than chance differences.

In order to determine whether these results held equally well for all types of students, analyses were made comparing the achievement of only the best third, or the poorest third of the two groups. In these compari-

[1] The honor point ratio is based on a scale of A = 3, B = 2, C = 1, D = 0, E = −1, F = −1.

sons, the eleven highest from the experimental group were compared with the eleven highest from the control group regardless of pairing. In almost all cases this resulted in the same comparisons as if pairs had been selected. The chief exception occurred in the comparisons of the lowest third of the control group in honor point ratio where five substitutions occurred. The comparisons of the upper third of the two groups are shown in Table IV.

TABLE IV

COMPARISON OF ACHIEVEMENT OF THE BEST THIRD OF GROUPS

Eleven Highest in P.R.C.A.T.

	Mid-Term		Final	
	Experimental	Control	Experimental	Control
Mean	53.86	50.73	120.68	117.95
Standard Deviation	6.69	8.68	15.40	13.25
$M_1 - M_2$	3.13		2.73	
S. E. $M_1 - M_2$	4.63		8.63	
$\frac{M_1 - M_2}{\text{S. E.}_{M_1 - M_2}}$	.68		.32	

Eleven Highest in H.P.R.

	Mid-Term		Final	
	Experimental	Control	Experimental	Control
Mean	52.91	49.27	126.09	114.32
Standard Deviation	7.84	9.00	12.60	14.80
$M_1 - M_2$	3.64		11.77	
S. E. $M_1 - M_2$	5.07		8.33	
$\frac{M_1 - M_2}{\text{S. E.}_{M_1 - M_2}}$	.72		1.41	

The data in the preceding table show results which are practically identical with those found for the entire experimental and control groups. There is apparent a small but consistent superiority of the no-quiz group. A noticeable difference in variability appears in that the best third of the control group has a larger standard deviation than the best third of the experimental group in every comparison but one.

Similar comparisons for the lowest thirds of the groups are shown in Table V.

TABLE V

COMPARISON OF ACHIEVEMENT OF THE LOWEST THIRD OF GROUPS

Eleven Lowest in P.R.C.A.T.

	Mid-Term		Final	
	Experimental	Control	Experimental	Control
Mean	45.68	44.55	106.14	97.50
Standard Deviation	7.68	11.60	17.20	17.85
$M_1 - M_2$	1.13		8.64	
S. E. $M_1 - M_2$	5.81		10.56	
$\frac{M_1 - M_2}{\text{S. E.}_{M_1 - M_2}}$	.19		.82	

Eleven Lowest in H.P.R.

	Mid-Term		Final	
	Experimental	Control	Experimental	Control
Mean	42.68	42.05	97.05	97.50
Standard Deviation	5.76	10.30	14.99	15.50
$M_1 - M_2$	.63		—.45	
S. E. $M_1 - M_2$	5.27		9.18	
$\frac{M_1 - M_2}{\text{S. E.}_{M_1 - M_2}}$	.12		.05	

The comparisons of the lowest third of the groups bear out in general the results previously shown. There are some noticeable differences, however. The first appears in that the lowest eleven in scholarship of the *control group* exceed by a very small amount the lowest eleven of the *experimental* or no-quiz group on the final examination. In the mid-term examination the experimental group is, as in all other comparisons, slightly superior to the control. This difference on the final examination is the first and only exception to the consistent superiority of the experimental group, and is, it must be admitted, hardly better than a chance difference. In the second place, the differences are smaller and of less significance than in preceding comparisons. This may indicate that occasional quizzes are more useful as motivating devices to low grade students than to others, since the less able students who had quizzes do on the whole equal the others here.

EFFECT OF THE COURSE IN GENERAL PSYCHOLOGY

Most of the students in the course in educational psychology had had an introductory course in general psychology, lasting one semester. A check on this fact disclosed that in the control group, 31 of the 33 paired individuals had taken the course in psychology, while only 26 of the 33 paired individuals of the experimental group had had this foundation course. In view of the fact that the achievement in educational psychology of the experimental group exceeded that of the control group in practically every comparison, the lack of a course in general psychology in a substantially larger number of cases does not seem to have been a serious handicap to the experimental group. However, it was thought desirable to determine what the effect of holding this factor constant might be. Of the 33 pairs, 26 were found in which both members of the pair had had general psychology. The comparative achievement of control and experimental groups for these pairs is shown below.

TABLE VI

ACHIEVEMENT OF ONLY THOSE WHO HAD TAKEN GENERAL PSYCHOLOGY PREVIOUS TO TAKING EDUCATIONAL PSYCHOLOGY—TWENTY-SIX PAIRS

	Mid-Term		Final	
	Experimental	Control	Experimental	Control
Mean	46.35	46.35	109.23	106.15
Standard Deviation	9.00	10.95	20.40	18.67
$M_1 - M_2$	.00		3.08	
S. E. $M_1 - M_2$	3.91		7.66	
$\frac{M_1 - M_2}{\text{S. E. } M_1 - M_2}$	.00		.40	

The number of cases is too small to permit of comparisons between those having had general psychology and those who had not had this course before taking educational psychology. However, since the means on mid-term and final examinations in Table III and Table VI are so nearly alike it does appear that the addition of the students who had not had general psychology to the groups compared does not cause any large or significant change in the average achievement of the group. In fact, the means for the groups which include those not having had general psychology are higher in three instances out of four than those shown in Table VI which are based on only those who had had general psychology.

CORRELATIONS

Certain relationships were considered in studying the results of this experiment, some of which may be cited. The correlation between percentile ranks on the college ability test and scores on the mid-term examination was .245. Between the same ranks and scores on the final examination, the correlation was + .315. Correlations of honor point ratios with scores on mid-term and final examinations respectively were + .367 and + .481. In both cases the correlations of scores on the final examination with the two criteria mentioned is higher than in the case of the mid-term. The greater length and increased reliability of the final, as compared with the mid-term examination is probably reflected by these differences in the size of correlation obtained.

Although an attempt was made to match individual pairs on age this could not be done. It is certain that the average age of the experimental and control groups were practically the same. The relationship between chronological age and scores on the mid-term examination was − .216; between C.A. and scores on the final it was − .113. Both are low but consistent in showing a tendency for the younger students to do somewhat better work. This is, of course, what is usually found in more marked degree within any given grade in school. All correlations are based on 92 cases from classes of three years.

STUDENT REACTIONS

In the experimental group as each student handed in his final examination he was given a brief questionnaire on the course just completed. The first question was "Did you enjoy this course?" Approximately 72 percent responded affirmatively. These ranged from "liked it better than any other education course I have taken" to a simple "yes." About 20 percent answered affirmatively but qualified their answers in some way such as "I did not like the first half but liked the last half." About 8 percent said they did not enjoy the course and about 2 percent did not answer this question.

The second question was "Would you have enjoyed the work more if there had been occasional written quizzes?" In response, 55 percent answered affirmatively, 14 percent were uncertain and 30 percent said "No."

The third question was "Do you think that occasional short written quizzes would have made you learn more? In answering this be as candid

and objective as possible. Do you actually do better work in courses where written quizzes are used occasionally?'' To this question 78 percent replied affirmatively, 6 percent were uncertain, and 16 percent replied in the negative.

These replies indicate, briefly, that the majority of the students liked the course, that about half said they would have enjoyed it more if there had been occasional written tests, and more than three-fourths stated that they thought they would have learned more if there had been such tests. It is interesting to note that some students stated that they would have learned more but would not have enjoyed the course more if there had been quizzes.

Since the students were told not to sign the questionnaires and were assured that no attempt would be made to determine identities of respondents, there is no reason to doubt the sincerity of the responses.

SUMMARY

1. Instructors and students generally believe that written tests in college classes improve learning and achievement.

2. Evidence from studies of learning in college classes is conflicting. Some indicate that tests or quizzes do improve learning, particularly immediate learning. The results from most studies are largely negative as far as the effect of quizzes on final achievement as measured by comprehensive objective examinations is concerned.

3. The results of the study reported here indicate unequivocally that students in a class where no quizzes of any sort were used, other than a mid-term and a final examination as here described, show consistently though not substantially higher average achievement than is shown by students in classes where occasional written quizzes were given.

4. In the case of less able students quizzes seem to have greater effect on achievement than in the case of brighter students. The only difference found in this experiment which favored the quizzed group occurred in the comparisons of the lowest third of the groups.

5. The training received in a previous course in general psychology seems to have little effect on achievement in educational psychology as measured here.

CONCLUSION

The results presented here raise a serious question. To say that periodic quizzes do not make any measurable difference in achievement

is one thing, but to say that they actually result in lower scores on comprehensive objective measures of achievement is quite another. It goes against all our traditions and beliefs about motivation and methods of teaching. Yet, insofar as the results of this study have validity, they suggest that this may be the case. It may be that when students have occasional quizzes they feel more secure and therefore take the longer examinations less seriously. When they realize that their mark in the course depends solely on what they do in two examinations instead of in three times that many, it is not unreasonable to suppose that they will study harder for those two.

The implication that less able students are helped more by frequent testing than superior students are, is potentially valuable in teaching. Perhaps if a method could be used whereby the best students in the class were excused from quizzes to study while the less able took the tests, all students would receive the maximum benefit.

There is no evidence here, and little in other studies, to support the common belief among instructors that written tests as commonly used motivate learning or increase total achievement in college classes. If they do add something to the effectiveness of our teaching, this fact remains to be demonstrated with other measures than those used in studies reported up to the present time.

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EDITORIAL

AN EXPERIMENT IN THE PROFESSIONAL EDUCATION OF SECONDARY SCHOOL TEACHERS

GIVEN below is the outline of a suggested experiment in the professional education of teachers. In general, the experiment proposes a series of pupil-centered and coöperatively-designed teacher and pupil activities based upon the learning processes of pupils at work. The part of the program here outlined is that which pertains to the courses in educational psychology, general and special methods of teaching, and practice teaching. Pre-educational sequences supplying the necessary general education, training in major and minor subject matter fields, and additional and professional courses relating to the child and the school are assumed to be brought together as a social institution.

As an outline of the hypothesis assumed for such an experiment the following nine topics suggest some of the possible processes which may be used.

I. *Subject field:* Any of the major areas of learning as, for example, Social Studies.

II. *Length of course:* One year; ten credits (equivalent to educational psychology, general and special methods courses, and practice teaching.)

III. *Number Student Teachers Desired:* Twenty-five or more students chosen from the present larger group of majors, selected according to a plan of admission to be later described.

IV. *Personnel:* One educational generalist (coördinator) plus two or more critic teachers (constituting a committee in charge of this part of the program).

V. *Plan for Selecting Students:*

A. Factors to be considered in making the choice of student teachers.

1. The student's intelligence (or general academic aptitudes).
2. The student's emotional stability.
3. The student's social proficiency and adjustment.

4. The student's health, physical energy, and vitality.
5. The student's knowledge of the subject matter field concerned, and cultural background.
6. Skill in expression.
7. The student's interest in teaching.

B. Procedure to be employed in the choice of students:

Most institutions will already have available much of the data referred to above. Where the data are not available the committee in charge will choose and administer appropriate tests. From these data the committee will prepare a preferred list of students.

VI. *Organization of Course:*

A. General character of the student's work. This work should involve:

1. *Participation:*

(a) in the regular class work of a training school class as a regular member of the class doing the work of the class for one period daily five days a week; and

(b) in the planning and directing of the learning experiences of the pupils in participating classes as student teachers.

2. *Laboratory:*

one two-hour period per week devoted to the first hand study of pupil learning, behavior, etc.

3. *Conference:*

(a) Individual conference as necessary;

(b) group conference two hours per week. (The conferences the first semester might well center about the problems of instructional planning and those of the second semester about the direction of the learning experiences of secondary school pupils.)

4. *Reading* from a selected list (library) of professional books as necessary.

5. *Papers:*

a. First semester: a plan of instruction for the class to be taught.

b. Second semester: A paper summarizing the

major generalizations reached by student teachers during their year's work.

B. Suggested training experiences.

1. Participation in educational planning.
   a. Choice of educational objectives.
   b. Choice of learning experiences.
   c. Choice of methods.
   d. Choice of materials.
   e. Choice of evaluation techniques.

(The experiences at this level should involve the active participation of student teachers in the planning of units of instruction to be employed in the actual instruction of pupils in practice classes in the training school.)

2. Participation in the direction of the learning experiences of high school pupils.
   a. Participation in the handling of the routine aspects of classroom instruction, such as care of ventilation, passing and collecting papers, care for bulletin boards, housekeeping, etc.
   b. Participation in the handling of group conferences designed to offer leadership in the instructional activities of training school pupils.
   c. Laboratory studies of the behavior and scholarship difficulties of high school pupils.
   d. Full responsibility for the direction of class exercises for not less than five full class periods.
3. Participation in educational evaluation.
   a. Choosing means of evaluation.
   b. Constructing instruments of evaluation when necessary.
   c. Grading papers, examinations, etc.
   d. Recording grades, making out reports, etc.

VII. *Shortcomings in the Conventional Method of Training Teachers Considered in the Proposed Experiment:*

First of all, the subject matter approach does not offer meaningful experiences to the average inexperienced undergraduate

student in education. The discussions and readings associated with the average course in Education are likely to be highly abstract, verbal, and non-meaningful. Secondly, the logically organized subject matter approach to Education has not generally proved interesting and worth while from the student's point of view. He lacks the first hand experience with concrete learning and teaching situations to feel personally the values of the subject matter presented. Thirdly, in so far as the materials are for the most part unmeaningful, they are forgotten in the time that elapses between the study of theory and its use in practice, and thus is not applied. Finally, fourth, theory however well learned may not be applied. There is always a wide gap between theory and practice at best.

VIII. *Underlying Philosophy of the Proposed Experiment:*

In the experimental study here proposed the professional education of teachers takes its point of departure from the purposes of education and the sort of pupil product desired. It conceives of pupils, student teachers, and educationalists working together coöperatively for the achievement of the purposes of education. While the professional educator may help student teachers through conferences and directed reading outside of class, the plan here proposed assumes active participation on the part of the professional educator in the direction of the essential learning experiences of the classroom with the thought that he may demonstrate as well as explain verbally effective methods of classroom instruction. Altogether the three basic approaches to learning, namely: learning by doing, learning by observation, and learning by verbal communication, are presented simultaneously to the student teacher in an integrated program of learning experiences. The choice of learning experiences, methods, and materials are considered not in abstract but in relation to concrete learning and teaching situations. Both the handling of the particular situation at hand and training for the effective handling of future situations of a similar character are anticipated in the experiment; the latter is to be approached inductively through the generalization of experience gained in concrete learning and teaching situations. The paper requirement of the course referred to above constitutes in fact a student prepared textbook in the field

of professional education. In general, the program for the institutional training of teachers here presented is merely an adaptation of the program for the professional education of teachers in service already presented by the writer on numerous other occasions.[1]

IX. *Experimental Evaluation:*

The outline here presented is merely a hypothesis as to what might prove effective if tried in the professional education of teachers. The importance of studying the teaching of reading, arithmetic, and other school subjects experimentally has been frequently emphasized; the suggestion here offered is that educationalists employ these same methods in evaluating their own creative efforts in the field of the professional education of teachers. The experiment will involve controls and instruments of evaluation as in other fields of experimentation.

A. S. Barr.

[1] Barr, A. S., Brueckner, Leo J., and Burton, William H. *Supervision: Principles and Practices in the Improvement of Instruction.* New York: D. Appleton-Century Company, 1938.

REVIEWS

Address all communications relative to book reviews to Editor Kai Jensen, University of Wisconsin, Madison, Wisconsin.

RACE, HENRIETTA V. *The Psychology of Learning Through Experience* (Boston: Ginn and Company, 1938), pp. viii + 384. $2.00.

This book, written with the elementary school teachers in mind, attempts to give an educational psychology and an educational philosophy in one volume. The psychology is the connectionism of Thorndike and the philosophy is the pragmatism of Dewey. The synthesis is not entirely successful. The prevailing spirit of the book is that of modern progressive education, and the author probably weakens her case by playing around with neurons and synapses. For example, in discussing the development in children of the ability to draw a diamond, she writes, (p. 110): "Inactive neurons have probably made first connections with energized axones of other neurons. Later, because of development in discrimination, in the child's effort to copy the diamond, the points of the diamond come into relief and the child reacts to the parts as such; the synapses have become more complicated." This is hardly in place in a book whose chief virtue is its functional character.

The author is not always accurate in her statements. On page 107 we read, "Gesell . . . found that a child one year old matches a circle with a circle and a square with a square." And on page 142, with reference to one of Thorndike's experiments on after-effects, "Looking over one's work, noting its meaning and relations, repeats the reactions of the neurons and brings the added effect of another satisfaction. Such a response, rewarded, gives a strengthening of at least 64.4 percent." Both these statements are misleading.

In spite of these weaknesses, however, the book should prove very useful to anyone interested in the art of teaching at the elementary school level. Most textbooks in educational psychology suffer from being too academic in character. They do not necessarily improve the teaching of those who study them. Throughout most of her book Dr. Race avoids this fault. She links theory with practice, and clarifies her arguments by appropriate illustrations from the classroom. In fact, it would be difficult for one interested in the improvement of teaching to find a book on learning more functional in character.

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DOUGLAS, O. B., and HOLLAND, B. F. *Fundamentals of Educational Psychology* (New York: The Macmillan Company, 1938), pp. xv + 598. $2.50.

Since this book has been tried out in manuscript form for a number of years, one would naturally expect it to be a usable text. And such proves to be the case. It is distinguished by a wealth of homely examples and is very readable. Contrasted with most of the standard texts in the field, this one interprets its mission in a far more catholic fashion. Some of its

material is similar to that usually found in texts on principles of education. Each section and chapter is preceded by a paragraph outlining the purpose of the section or chapter, and each chapter is followed by a set of exercises and a bibliography limited to secondary sources. There are numerous illustrations and these, curiously enough, are frequently mis-labelled. In Figure 1, for example, the vitreous humor is described as a clear liquid. The meissner corpuscle, Figure 9, is usually regarded as a sense organ for pressure, not for heat. The tear gland, Figure 20, should be placed above the eye, not below it. In Figure 22 the liver and pancreas are wrongly indicated. Figures 24 and 38 may cause confusion in the mind of the student regarding the extent of sigma variability. These should be corrected in the next printing as they lead the reader to believe that the work is unscholarly and such is not the case. The cyclic method of presentation has been adopted. Instead of a single discussion of the laws of exercise and effect, these laws are discussed in several chapters devoted to different types of learning.

Although the book has had an extensive try-out, the reviewer suspects that it contains far too much material for an introductory course. It is, however, one of the better texts and undoubtedly will be widely used.

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NICHOLAS, FLORENCE WILLIAMS, MAWHOOD, NELLIE CLARE, and TRILLING, MABEL B. *Art Activities in the Modern School* (New York: The Macmillan Company, 1937), pp. xiv + 379. $3.25.

In recent years there has been a growing tendency in art education to eliminate the static, sometimes unwieldy courses of study, to depend more and more on good and up-to-date reference material, and to correlate the art work with the rest of the activities of the school.

Art Activities in the Modern School by Nicholas, Mawhood, and Trilling is one of the new contributions to the literature of art education which has taken into consideration the changing factors in general education in which art is an integral part of the school curriculum.

The book begins with a statement of five objectives, (instead of the customary thirty of forty) and then continues with a chapter entitled "Selection of Art Experiences."

Other chapters are devoted to the "Techniques of the Art Lesson," "Creative Self-Expression," "Activities in the Child-Centered Art Class," "Industrial Art Activities," and "Measurements in Art Education."

Based on sound, modern, educational principles the text is sufficiently supplemented with illustrative material to make it of value to prospective art teachers, elementary teachers, and experienced art teachers who need new stimuli and interpretations.

As a welcome departure from the old drawing book style, the book presents five different methods of figure drawing to meet the demands of growing children; three methods of animal drawing are suggested. An attempt is then made to adapt the style to a particular grade level.

To advocate that a method is necessary to draw figures or animals is questionable. It is at times more vital to represent a figure or animal in an entirely personal and expressive manner, without following any method or without regard for anatomical correctness. Animals have played an important part in art since the beginning of recorded history. The drawings of bisons made by Primitive Cave Men are today recognized as unquestioned works of art and as superb examples of masterly draughtsmanship.

The chapter on "Scientific Measurement in Art Education" starts with a justification of scientific measurements in art education and then lists the various tests and scales published so far and what they attempt to accomplish. In most cases the tests measure only one kind of drawing ability, while the appreciation tests are presumably based on the theory that taste and creative ability can be measured according to definitely established rules or criteria. Much needs to be done in this particular field and only when the scientist works in close coöperation with the creative artist can the problem be solved.

The encouraging thing about art education to me is the very fact that "nothing approaching standardized organization has been achieved" and that there is therefore freedom for teacher and for the child to grow according to his capacity, and in harmony with his own particular environment.

Flexibility and constant change are essential to progressive art work. *Art Activities in the Modern School* is a book which should be in every classroom and should be read carefully and critically. The book has much to commend it.

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MCEACHERN, EDNA. *A Survey and Evaluation of the Education of School Music Teachers in the United States.* Contribution to Education, No. 701 (New York: Bureau of Publications, Teachers College, Columbia University, 1937), pp. viii + 183. $1.85.

Pupils, more than anyone else, are affected by the quality of teachers employed in different fields. But pupils do not select teachers. Therefore, *The Education of Music Teachers,* although of greatest moment to pupils, should be read by administrators who employ teachers and by college authorities who plan and designate the courses to be taken by prospective music teachers.

Although most of the conclusions of the volume under review were presented in Chapter XX of Part II of the *Thirty-fifth* Yearbook of the National Society for the Study of Education, details about the validation of the conclusions by juries are valuable and suggestive to research workers who may investigate the education of teachers in other fields. This validation was conducted through juries of "superior educators of music teachers" and "school music teachers in the field." Recognizing the need for a five-year curriculum in music education for teachers, the author realistically sets up a four-year curriculum, which should be studied carefully by college and university authorities. Employers, in turn, should look for their new teachers in higher institutions which require such a curriculum for the prospective teachers. This word to employers is the most urgent because, as Beattie states in the Yearbook mentioned above, few administrators are as familiar with the special problems of music education as they are with the problems of most other subjects. Six important directions of further research are stated in the closing pages of this monograph (pp. 141-142).

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RESEARCH ABSTRACTS and BIBLIOGRAPHIES

Address all communications relative to research abstracts and bibliographies to A. S. Barr, University of Wisconsin, Madison, Wisconsin.

BULLETINS

BRIGGS, THOMAS H., and OTHERS. *Laboratory Techniques of Teaching: The Contribution of Research to Teachers Planning the Individualization of Instruction* (New York: Bureau of Publications, Teachers College, Columbia University, 1938), 81 pp.

This bulletin proposes to: illustrate a type of study much needed in education; present the major problems of the laboratory techniques in high school teaching, about which information is needed; furnish a selected bibliography for those who wish to study the problem further; summarize and interpret the pertinent and substantiated studies that have been published; and indicate the areas in which additional research needs to be made.

CARR, WILLIAM G., and OTHERS. "Statutory Status of Six Professors," *Research Bulletin of the National Education Association* (Washington: Research Division, National Education Association, September, 1938), 52 pp.

This bulletin discusses the status of the professions of accountancy, architecture, law, medicine, nursing, and teaching with respect to the legal regulations for admission to the professions, the legal provisions for expulsion from professions and revocation of licenses, and a sampling of cases brought to trial against offenders. Bibliography.

CARR, WILLIAM G., and OTHERS. "Safety Education through Schools," *Research Bulletin of the National Education Association*, Vol. XVI, No. 5 (Washington: Research Division, National Education Association, November, 1938), 59 pp.

This bulletin discusses the current practices in safety education, the methods of safety teaching, sources of instructional materials, the necessary improvements in the teaching of safety in the schools, problems that lie ahead, where safety aids may be obtained, reviews of safety films and slides. Index to Volume XVI.

CHARTERS, W. W. (Editor). "The Eight-Year Study of the Progressive Education Association: Reports of the Director and the Curriculum Staff for 1938," *Educational Research Bulletin of Ohio State University*, XVII (November 16, 1938), 45 pp.

This report of the director and the curriculum staff of the Progressive Education Association for 1938 contains discussions on: the commission on the relation of school and college, development of a core curriculum, social studies, travels of a curriculum associate among the secondary schools, and experimental work and progress in the field of science.

DIX, JOHN P. *Vocabulary Booklet in the Social Studies for Junior and Senior High Schools*, Revised Edition (Car-

thage, Mo.: Carthage Press Printing Company, 1938), 120 pp.

This bulletin is intended to serve as a supplementary pupil-teacher manual used as a part of and an aid to regular teaching units and activities in the social studies of junior and senior high school level.

FOSTER, CHARLES R., JR. "Editorial Treatment of Education in the American Press," *Harvard Bulletins in Education*, No. 21 (Cambridge: Harvard University Press, 1938), 303 pp.

The author examined some 9,000 editorial comments on education appearing in twenty-five selected American newspapers during a period of five years and found that general value and purpose of education, athletics and superintendents and administrators were the three most frequently mentioned topics.

GRAHAM, BEN G., and OTHERS. "Youth Tell Their Story (Abstracts)," *Pittsburgh Schools*, XIII (September-October, 1938), 28 pp.

This bulletin contains abstracts from the report of the survey for the American Youth Commission, entitled "Youth Tell Their Story."

HOLY, T. C. *The Disposition of School Bond Issues and Special Levies Submitted in Ohio School Districts Between January 1 and November 8, 1938, Inclusive* (Columbus: Bureau of Educational Research, Ohio State University, November, 1938), 27 pp. Mimeographed.

This report is divided into two parts: First, the disposition of school bond issues and special levies submitted in Ohio city and exempted village school districts; and Second, the disposition of school bond issues and special levies submitted in Ohio County school districts.

IRWIN, FRANK L. "A Comparative Study of the College Preparation, Teaching Combinations, and Salaries of Kansas High School Teachers (1938)," *Studies in Education, Kansas State Teachers College of Emporia*, XVIII, No. 9 (Emporia: Kansas State Teachers College, September, 1938), 38 pp.

The author has prepared an analysis of the daily teaching programs of approximately 5200 high-school teachers in Kansas as found on reports for the school year 1937-38 which tends to show that the schools are definitely tending toward the one-subject field of instruction.

REAVIS, WILLIAM C. (Editor). "Critical Issues in Educational Administration." *Proceedings of the Seventh Annual Conference for Administrative Officers of Public and Private Schools, Volume I* (Chicago: The University of Chicago Press, 1938), 192 pp.

This bulletin which is devoted to the proceedings of the first conference for administrative officers of public and private schools, is divided into the following sections: the bearing of social and economic change on public-school organization and administration, maintaining the proper balance between general and vocational education in urban school systems, providing effective guidance under present conditions in elementary and secondary schools, developing effective types of in-service training for teachers in urban school systems, and meeting the problem of political interference in city school administration.

SKEELS, HAROLD M., UPDEGRAFF, RUTH, WELLMAN, BETH L., and WILLIAMS, HAROLD M. "A Study of Environmental Stimulation: An Orphanage Preschool Project," *Studies in Child Welfare, University of Iowa Studies*, XV, No. 4 (Iowa City: University of Iowa, December 1, 1938), 191 pp.

The authors studied the effect of preschool education on intelligence, language, general information, social maturity, behavior adjustments, and motor achievements under controlled conditions with groups matched on chronological age, mental age, intelligence quotient, sex, nutritional status and length of residence in the orphanage; and the data tend to indicate that the children having preschool education are superior to those having no preschool education in the factors studied.

SMITH, HENRY LESTER. (Director). "Twenty-fifth Annual Conference on Educational Measurements," *Bulletin of the School of Education, Indiana University*, XIV, No. 4 (Bloomington: Bureau of Coöperative Research, University School of Education, Indiana University, September, 1938), 37 pp.

The topics discussed at the Twenty-fifth Annual Conference on Educational Measurements held at Indiana University, April 13, 1938 were on: The Value of the Dictaphone in Diagnosing Difficulties in Addition, The Measurement Program in a City School System, The Nature of and Factors in Ability in the Light of Recent Evidence, Relationship Between a Measurement Program and a Guidance Program, Intellectual Growth Based on Longitudinal Studies.

WELLMAN, BETH L. "The Intelligence of Preschool Children as Measured by the Merrill-Palmer Scale of Performance Tests," *Studies in Child Welfare, University of Iowa Studies*, XV, No. 3 (Iowa City: University of Iowa, October 1, 1938), 150 pp.

On the basis of 510 testings of 281 children the author concludes that the Merrill-Palmer scale is not interchangeable with the Stanford-Binet.

EDUCATIONAL ADMINISTRATION AND SUPERVISION

HOBSON, CLOY S. "The Complimentary Mark," *The Elementary School Journal*, XXXIX (November, 1938), pp. 195-199.

The author discusses the advantages and the disadvantages of the complimentary mark and after listing the precautions for use of the mark, concludes that only two symbols are necessary, one indicating that the pupil has made satisfactory progress in his curriculum and the other indicating that he has not.

KARSLAKE, JAMES S., and KIRBY, THOMAS J. "Schedule-Making Made Easy," *The School Review*, XLVI (December, 1938), pp. 754-759.

The author presents a plan for schedule-making employing the use of registration cards with tabs attached.

PSYCHOLOGY OF LEARNING AND TEACHING

JACKSON, T. A., STONEX, E., LANE, E., and DOMINGUEZ, K. "Studies in the Transposition of Learning by Children," *Journal of Experimental Psychology*, XXIII (December, 1938), pp. 578-600.

Data gathered in a series of four experiments with forty-five children varying in age from two to six years in an attempt to determine the effect of different amounts of practice of a discrimination habit upon transfer in the transposition experiment seem to indicate that following a small amount of post-fixation practice of a discrimination habit, choice between transposed stimuli will be confused and unstable with frequent reverting to position habits.

PORTER, E. H. "The Influence of Delayed Instructions to Learn upon Human Performance," *Journal of Ex-*

perimental Psychology, XXIII (December, 1938), pp. 633-640.

On the basis of data gathered using nonsense syllables, technical terms, and riddles, the author found that the achievement of the subjects in the experimental groups was equivalent to that of the control groups.

PUPIL GUIDANCE, WELFARE AND DEVELOPMENT

ENGLE, THELBURN L. "A Study of the Effects of School Acceleration upon the Personality and Social Adjustments of High-School and University Students," *The Journal of Educational Psychology,* XXIX (October, 1938), pp. 523-539.

The author studied one hundred thirty-six students in three high schools and one university, matching pairs on sex, grade location, intelligence, and school marks and concludes that personality adjustment, as measured by a personality schedule, is probably not appreciably affected by the single factor of school acceleration.

STATISTICS, MEASUREMENTS, AND SCIENTIFIC TECHNIQUES

DEARBORN, WALTER F., and ANDERSON, IRVING H. "Aniseikonia as Related to Disability in Reading," *Journal of Experimental Psychology,* XXIII (December, 1938), pp. 559-577.

The authors analyzed records of examinations for aniseikonia of 100 cases of severe disability in reading and of 100 control cases and conclude that aniseikonia is one of the many factors that may contribute to the causation and persistence of disability in reading.

FENDRICK, PAUL, and MCGLADE, CHARLES A. "A Validation of Two Prognostic Tests of Reading Aptitude," *The Elementary School Journal,* XXXIX (November, 1938), pp. 187-194.

Based on one year of reading achievement, as measured by the Gates Primary Reading Test, an attempt was made to validate the prognostic value of the Detroit First-Grade Intelligence Test and the Metropolitan Readiness Test, evidence indicates that critical utilization of these two tests in selective combination enhances their significance for prediction of first-grade achievement.

WILLS, ANNIE R. "An Investigation of the Relationship between Rate and Quality of Handwriting in the Primary School," *The British Journal of Educational Psychology,* VIII (November, 1938), pp. 229-236.

The author studied the rate and quality of handwriting of 172 children ranging in age from 8 to 12 years and concludes that at every age level there is a well-defined tendency for normal speed and quality to vary together, speed increases up to eleven years, with the greatest amount of variation in quality occurring at the 10-year-old level.

NEW TESTS

Unit Scales of Attainment for Grades I to VIII, by M. J. VanWagenen and Others. Minneapolis: Educational Test Bureau, Inc. 1938.

Series of scales designed and developed to measure the level of attainment which any child has reached in the basic subjects of the elementary grades. Manual. Norms.

RESEARCH NEWS and COMMUNICATIONS

Address all research news and communications to Carter V. Good, Teachers College, University of Cincinnati, Cincinnati, Ohio.

DOCTORS' THESES UNDER WAY IN EDUCATION, 1938-1939

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This is the ninth annual list of Doctors' theses under way in education to be published in the January number of the *Journal of Educational Research*. The present list includes only the titles which have not been printed in the January, 1936, 1937, and 1938 numbers of the *Journal*. Therefore, in order to make a reasonably complete canvass of doctoral studies under way at present, it is necessary to examine these four lists, 1936-39.

Completed dissertations may be discovered through canvassing the annual bibliographies of research in education, published by the United States Office of Education, and through *Doctoral Dissertations Accepted by American Universities*, published annually by the H. W. Wilson Co.

Education remains a very broad field, at least as interpreted by some institutions. Certain of the thesis titles in this list appear to be more appropriate for such fields as political science, economics, geography, history, sociology, anthropology, English, mathematics, biology, zoology, medicine, agriculture, fine or applied arts, and religion than for education; for example, Nos. 13, 56, 81, 109, 126, 129, 180, 184, 193, 194, 277, 299, 316, 331, 395, 399, 411, 430, 451, 456, and 582. A well known teachers college and one of the large universities are especially active in the production of dissertations dealing with problems outside the immediate area of education.

In at least one institution there is a definite tendency to modify the strictly research type of dissertation in the direction of a teachers' manual, a students' handbook, a textbook, a laboratory manual, or an outline of curriculum materials; for example, Nos. 6, 68, 128, 138, 285, 304, 505, and 507.

Each year the compiler is keenly interested in noting the manner in which certain candidates have reformulated their problems. The extent to which mechanical means and human resources fall short of perfection may be represented in the change from "Silencing Noise in Shop Equipment" to "Reducing Noises in School Shops and Laboratories." Frequently an interval of a year means a sharper delimitation or restriction of the problem: from "A Study of the Classification Tests Used in Penal Institutions" to "The Evaluation of Intelligence Tests Used for the Classification of Persons in the Girls' Industrial School," and from "A Study of Pupil Performance in Long Division" to "The Verbal Thought and Overt Behavior of Children During Their Learning of Division."

Less commonly a problem is broadened in scope: from "The Administration of

the Citizenship Program in the Secondary Schools'' to ''The Organization and Administration of Extra-Curricular Activities in the Secondary Schools,'' from ''La Fontaine's Fables in French Elementary and Secondary Education'' to ''A Study of the Fable in Its Relation to Contemporary French Education,'' and from ''Education as Reflected in Eighteenth Century English Romances'' to ''Education as Reflected in Eighteenth Century English Fiction.'' Occasionally one part of the problem is broadened, while another part is restricted more sharply, as illustrated by the change from ''The Hearing Span: Its Relation to Reading Rate and Comprehension'' to ''Visual and Auditory Determinants of the Rate of Reading.''

Most doctoral candidates require more than a year to complete the dissertation, partly because many graduate students in education are field workers who have positions to command their attention. A rough estimate of the spread of time represented may be had by analyzing the approximately 200 dissertations in progress at Teachers College, Columbia University. In round numbers these 200 current titles are first listed as follows in the January number of the *Journal:* 1936, 30; 1937, 50; 1938, 45; and 1939, 75. It is true that some of these problems were initiated earlier than 1936; however, the plan of compilation followed provides for relisting a title which has not appeared during the three preceding years.

In all cases the name of the student, thesis title, and graduate institution are given, and in most instances the major adviser or advisory committee is listed. No differentiation is made in this compilation between Ph.D. and Ed.D. problems.

The institutions which have sent titles for inclusion in the 1938-39 list are: Boston College, Boston University, Bryn Mawr, Buffalo, California, Catholic University, Chicago, Cincinnati, Colorado, Colorado State College of Education, Columbia, Cornell, Drew, Duke, Fordham, George Washington, Harvard, Illinois, Indiana, Iowa, Johns Hopkins, Kansas, Kentucky, Louisiana, Loyola, Michigan, Minnesota, Missouri, Nebraska, New York, North Carolina, North Dakota, Northwestern, Ohio, Oklahoma, Oregon, Peabody, Pennsylvania, Penn State, Pittsburgh, Rutgers, Southern California, Syracuse, Temple, Texas, Virginia, Washington, Western Reserve, Wisconsin, and Yale.

In the topical index an effort has been made to classify each title under one or more headings; for example, ''Secondary Education in Colonial America'' is indexed under both ''History of Education'' and ''Secondary Education.'' The numeral in the index refers to the corresponding number in the alphabetical list of doctoral candidates.

As in other years, such special fields as art, foreign language, home economics, and music have been studied relatively infrequently in doctoral theses. Problems in the areas of social and psychological adjustment, as well as historical and comparative education, seem relatively numerous this year, which is not strange in view of world wide developments affecting social, economic, political, and educational issues. An inspection of the topical index will provide information concerning the extent to which other areas and problems are being studied in doctoral dissertations.

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NEW 1938-39 LIST

1. Abraham, Herbert. "Utilizing the Results of the Evaluation Program to Improve the Guidance Services of a Secondary School." Ohio. Raths.
2. Addleman, Nelson. "The Place of the Teacher in Curriculum Development." Pittsburgh. Harris.
3. Aiosa, Anthony. "A Study of Heredity and Environment Involving Twins and Siblings." Johns Hopkins. Stephens.
4. Albright, D. M. "Expanding Functions of the State Department of Public Instruction in Pennsylvania Since 1874." Pittsburgh. Yeager.
5. Alexander, Fred M. "An Interpretation and Appraisal of State Curriculum Programs." Columbia. Hopkins.
6. Alexander, Ida Grace. "Teacher's Manual for the Integration of English IV, American Literature, and United States History." New York. Creager.
7. Alford, Harold D. "Legal Aspects of District Reorganization." Columbia. Cyr.
8. Alexander, Philip W. "John Eaton." Peabody.
9. Ali Abadi, Ahmad Khan. "Higher Education in Iran: Its Evolution, Its Trends, and Plans for Its Improvement." New York. Creager.
10. Allen, Corrie W. "A Study of the Influences of Psychological Research in Learning on the Development of the Teaching of English in the Grades." Texas. Henderson.
11. Allen, Harlan B. "Origin, Development, and Evaluation of the General Policies and Practices Governing Teacher Certification in New York State." New York. Suhrie.
12. Allen, Harry R. "Education in Chester County in Colonial Times." Temple. Kuehner.
13. Anders, James M. "Congressional Career of John T. Morgan." Peabody.
14. Anderson, John P. "A Study of the Relationship Between Parental Attitudes and the Behavior of Junior High School Pupils." Columbia. Symonds.

15. Anfinsen, Rudolph D. "Evaluation in Terms of Child Development of the Minneapolis Program of Promotion in the Elementary Grades." Minnesota. Brueckner.
16. Appel, Madeline Hunt. "Aggressiveness in Young Children." Bryn Mawr. Forest.
17. Apperson, Sarah. "The Effectiveness of Orthoptic Training as a Means of Remedial Instruction in Reading." Nebraska. Worcester.
18. Apple, Joe Alton. "Student Teaching in American History in the State Teachers College." Columbia. Stratemeyer.
19. Arms, George W. "The Social Criticism of William Dean Howells." New York. Barnes.
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